REMARKS

This response is being presented in response to the Advisory Action of March 4, 2004. The Examiner has indicated that all of the claims, that is claims 1-22 and 34-44, have been rejected. In light of the amendments and following detailed arguments, it is respectfully submitted that the claims fully distinguish over the applied prior art and are in condition for allowance.

The Examiner rejected claims 1-4, 8, 10-14, 18, 23, 34, 38-40, 42 and 44 under 35 USC §103 as being unpatentable over Proscia (US 5,286,520) in view of Tracy et al (US 4,687,560) and Florczak (US 6,268,019). Claims 1, 2, 4-9, 17-22, 34-37 and 40-44 were rejected under 35 USC §103 as being unpatentable over Gallego et al (US 6,048,621) in view of Tracy et al and Florczak. Claims 1, 2, 5-8, 10-16, 18, 23, 34-35, 38-42 and 44 were rejected under 35 USC §103 as being unpatentable over Riaz et al (US 5,385,751) in view of Tracy et al and Florczak. Claims 1, 2, 8, 10-14, 17, 19, 34, 38-40 and 42 are rejected under 35 USC §103 as being unpatentable over Florczak in view of Proscia or vice versa.

On page 8 of the office action of December 4, the Examiner agrees with applicant's arguments in the last amendment, and therefore incorporates Florczak into the present amendment. The following comments will address these new rejections.

The present invention provides a chemical vapor deposition process for the production of a tungsten oxide coating which uses particular tungsten precursors and which is carried out in a temperature range (500°-720° than was previously contemplated. This allows coatings to be deposited within a range of stoichiometries. The higher temperatures of the range offer advantages in the on-line production of coated glass, as there is an improved opportunity to deposit an additional coating or coatings on-line.

It is important to note that each of the independent claims has been amended herein to indicate that the claims take place in a chemical vapor deposition process. Support for this amendment can be found, at least, at page 2 line 1 of the published PCT application (page 2, beginning with line 18 of the filed US application). It is submitted that this amendment further distinguishes the claimed processes and those which are disclosed in the applied references.

Independent claim 1 was rejected: under 35 USC §103 as being unpatentable over Proscia in view of Tracy and Florczak; under 35 USC §103 as being unpatentable over Gallego in view of Tracy and Florczak; and under 35 USC §103 as being unpatentable over Florczak in view of Proscia or vice versa.

Independent claim 1 is directed to a chemical vapor deposition process for depositing a coating comprising tungsten oxide on the surface of a glass substrate to produce a solar control glass which transmits a high percentage of incident light. The process directs a gaseous stream comprising tungsten oxyhalide or tungsten chloride and a source of oxygen on to the surface of the glass substrate. The glass substrate is at a temperature in the range 500°C to 720°C.

Independent claim 20 was rejected under 35 USC §103 as being unpatentable over Gallego in view of Tracy and Florczak. Claim 20 is directed to a chemical vapor deposition process for coating glass. The process comprises directing a gaseous stream containing a tungsten compound and a source of oxygen on to the surface of a glass substrate thereby forming a non-stoichiometric tungsten oxide layer. The tungsten oxide layer is overcoated with a further layer.

Independent claim 38 was rejected under: 35 USC §103 as being unpatentable over Proscia in view of Tracy and Florczak; 35 USC §103 as being unpatentable over Riaz in view of Tracy and Florczak; and 35 USC §103 as being unpatentable over Flroczak in view of Proscia or vice versa. Independent claim 38 defines a chemical vapor deposition process for coating glass. The process includes entraining a tungsten compound in a gas by flowing the gas over a tungsten compound at a temperature below its melting point. The gaseous stream is directed onto the surface of a glass substrate thereby forming a tungsten oxide layer. The glass substrate is at a temperature in the range of 500°C to 720°C.

Independent claim 40 was rejected: under 35 USC § 103 as being unpatentable over Proscia in view of Tracy and Florczak; under 35 USC §103 as being unpatentable over Gallego in view of Tracy and Florczak; under 35 USC §103 as being unpatentable over Riaz in view of Tracy and Florczak; and under 35 USC §103 as being unpatentable over Florczak in view of Proscia or vice versa.

Independent claim 40 defines a method of coating glass which comprises providing a glass substrate in a chemical vapor deposition process having a temperature in the range of 500°C to 720°C. Then, preparing a gaseous stream comprising a source of oxygen and a tungsten compound selected from the group consisting essentially of tungsten oxyhalide and tungsten chloride. And finally, directing the gaseous stream on to the glass substrate, thereby depositing a coating comprising tungsten oxide on the glass substrate

Independent claim 41 was rejected: under 35 USC §103 as being unpatentable over Gallego in view of Tracy and Florczak; and under 35 USC §103 as being unpatentable over Riaz in view of Tracy and Florczak.

Claim 41 defines a chemical vapor deposition process for depositing a coating comprising tungsten oxide on the surface of a glass substrate. A gaseous stream comprising tungsten oxyhalide or tungsten chloride and an ester are directed on to the surface of the glass substrate.

Rejection of claims 1-4, 8, 10-14, 18, 23, 34, 38-40, 42 and 44 under 35 USC §103 as being unpatentable over Proscia (US 5,286,520) in view of Tracy et al (US 4,687,560) and Florczak (US 6,268,019).

The claim as now amended is directed to a CVD process which is carried out during a float glass production process. The float glass production process has been known for at least forty years and is used almost universally. It is well known that the ribbon is maintained under a protective atmosphere during its passage through the float bath. This may be appreciated by reference to GB 1507996 which describes the coating apparatus used in Examples 4 to 6 of the present application. At page 3 line 32 it is stated that a protective atmosphere for example 95% by volume nitrogen and 5% by volume hydrogen is maintained at a plenum in the headspace over the bath.

The claimed processes are distinguished from those described in USP 4,687,560 to Tracy, relied on by the Examiner. Tracey discloses *plasma assisted* chemical vapor deposition processes. Thus at column 4 line 3 Tracey states that "The combination of the reaction chamber pressure and the vapor pressure of the gases inserted into the chamber establish a system pressure

substantially less than atmospheric pressure. A *plasma reaction* is induced within the chamber and among the reactants". It is clear that the on-line CVD processes of this invention which are carried out at atmospheric pressure are distinguished from *plasma assisted CVD processes* such as those described by Tracey which are carried out at substantially lower temperatures.

In the Advisory Action, the Examiner noted that the claims did not exclude plasma. Independent claims, as amended herein, clearly refer to a chemical deposition process. The term chemical vapor deposition process (CVD) is well known in the art. It is submitted that one skilled in the art, when noting a chemical vapor deposition process, would not confuse that with a plasma deposition process, or a plasma assisted vapor deposition process.

As previously asserted, Tracy does not disclose a chemical vapor deposition process, as is used in the present invention, but instead teaches a plasma deposition process, which is significantly different, and would be so recognized by one skilled in the art. Tracy states, on column 2, line 58, that "plasma deposition occurs when an electrical discharge in a low pressure mixture of volatile reactants causes the formation of a variety of highly energetic species e.g. atoms, metastables, radicals, ions and the like which chemically react to form stable deposits." Further, in column 3, line 63, Tracy states that "the synthesizing process is generally achieved by inducing a plasma reaction among the reactants over a predetermined deposition period and under a carefully selected set of thermodynamic conditions." Tracy thus teaches that the reactants tungsten chloride and tungsten oxytetrachloride are useful in deposition processes carried out under vacuum, at low temperature and which use electrical energy to drive plasma formation. These processes are different from, and in fact are irrelevant to the chemical vapor deposition processes of the present invention, which are carried out at atmospheric pressure and high temperature, and which use heat to drive the reaction and not electrical energy. Thus, one skilled in the art would not look to the Tracy reference as being relevant to the chemical vapor deposition process of the present invention. Therefore, the use of the Tracy reference against the present invention is improper.

The Examiner goes on to state that he "has provided Florczak USP 6,268,019 in order to provide a reasonable expectation that the precursors may be used in a broad range of pressures". Applicants do not believe that this statement is justified. Florczak states clearly that this invention relates to atmospheric pressure chemical vapor deposition processes (column 1, line 12) and that his invention enables glass coaters to deposit high quality T_iO_2 films on the float line at the high line speeds practiced with commercial float lines without any major disruption (column 1, line 50). There is nothing in Florczak to suggest that his precursors are useful at anything other than atmospheric pressure.

Florczak also states that "to be economical the coatings must be deposited at rates which are commensurate with the operating speeds of a commercial float line" (column 1, line 21) and that "low pressure CVD processes are batch operations and produce films at low deposition rates" (column 1, line 38).

Applicant's claimed process is also directed to deposition processes which are carried out on-line during the float glass production process. Applicants submit that Florczak is correct in suggesting that low pressure processes are impractical because the line runs in an inert atmosphere at atmospheric pressure and second because the rate of deposition is unlikely to be high enough.

Plasma assisted CVD processes such as are disclosed by Tracey are intended to operate at lower temperatures and to provide higher deposition rates. Tracey's processes are operated at ambient temperature and offer what he describes as an enhanced rate of deposition. However, one skilled in the art would note that in Tracey's Example 1 this enhanced rate of deposition provides a 2000Å thickness of coating over a period of seven minutes i.e. approximately 285Å per minute. He would know that this is far too low to be of use in an on-line coating process as is evidenced by Florczak who *suggests that his process provide a deposition rate 1000Å/sec* (column 7, line 8). Applicant's processes deposit tungsten oxide at a far higher rate than is achieved by Tracey as evidenced in Table 2 (21nm/210Å per second and 24nm/240Å per second).

In view of the above, one skilled in the art would not regard Tracey as relevant to Applicant's invention as presently claimed. There is nothing in the secondary references which would suggest that Tracey's precursor would be useful in an on-line process.

In addition, the Examiner combines Tracy and Florczak to indicate that it was obvious to use tungsten chloride or tungsten oxytetrachloride in a CVD process for the deposition of tungsten oxide. Applicant again asserts that the Tracy reference is not applicable to the present invention because it teaches a different process, not one that a person skilled in the art would look to when designing a CVD process. With regard to Florczak, while this reference teaches a CVD method, nothing in this reference is relevant to the *deposition of tungsten oxide*. Florczak primarily addresses the deposition of titania using the reactor described in Figure 1 of the reference. Only in the abstract, and at column 6, line 55, does Florczak suggest the use of the process with any other metals. Even here, the only other suggested metals are tin germanium and vanadium. There is *nothing to suggest to one skilled in the art that the processes of Florczak would be compatible with metals outside this group, and certainly not to tungsten.* As there is no suggestion in Tracy to use a chemical vapor deposition process, and no suggestion in Florczak that the process described therein would be compatible with any metals not listed, i.e. tungsten, there is nothing in either reference to lead one skilled in the art to combine those references. Therefore, it is respectfully submitted that the combination of these references is improper.

In view of the above, it is respectfully submitted that the rejections of claims 1-4, 8, 10-14, 18, 23, 34, 38-40, 42 and 44 under 35 USC §103 as being unpatentable over Proscia (US 5,286,520) in view of Tracy et al (US 4,687,560) and Florczak (US 6,268,019) is improper and should be withdrawn.

Rejection of claims 1, 2, 4-9, 17-22, 34-37 and 40-44 were rejected under 35 USC §103 as being unpatentable over Gallego et al (US 6,048,621) in view of Tracy et al and Florczak.

As with the preceding rejection the Examiner acknowledges that Gallego does not teach the use of Tungsten oxyhalides or tungsten chlorides as required by the claims of the present invention. As with the preceding rejection, the Examiner relies on the disclosures of Tracy and Florczak to overcome these deficiencies.

As before, applicant respectfully asserts that Tracy does not disclose a chemical vapor deposition process, as is used in the present invention, but instead teaches a plasma deposition process, which is significantly different, and would be so recognized by one skilled in the art. As stated above, the claims of the present invention have been amended to specify that the present invention utilizes a CVD process, a term that is well known in the art. Tracy, as demonstrated above, thus teaches that the reactants tungsten chloride and tungsten oxytetrachloride are useful in deposition processes carried out under vacuum, at low temperature and which use electrical energy to drive plasma formation. These processes are different from, and in fact are irrelevant to the chemical vapor deposition processes of the present invention, which are carried out at atmospheric pressure and high temperature, and which use heat to drive the reaction and not electrical energy. Thus, one skilled in the art would not look to the Tracy reference as being relevant to the present invention. Therefore, the use of the Tracy reference against the present invention is improper.

Also, the use of Tracy and Florczak together suffers from the same deficiencies asserted above. The Tracy reference is not applicable to the present invention because it teaches a different process, not one that a person skilled in the art would look to when designing a CVD process. With regard to Florczak, while this reference teaches a CVD method, nothing in this reference is relevant to the *deposition of tungsten oxide*. Florczak primarily addresses the deposition of titania using the reactor described in Figure 1 of the reference. Only in the abstract, and at column 6, line 55, does Florczak suggest the use of the process with any other metals. Even here, the only other suggested metals are tin germanium and vanadium. There is *nothing to suggest to one skilled in the art that the processes of Florczak would be compatible with metals outside this group, and certainly not to tungsten.* As there is no suggestion in Tracy to use a chemical vapor deposition process, and no suggestion in Florczak that the process described therein would be compatible with any metals not listed, i.e. tungsten, there is nothing in either reference to lead one skilled in the art to combine those references. Therefore, it is respectfully submitted that the combination of these references is improper.

Therefore, it is asserted that the rejection of claims 1, 2, 4-9, 17-22, 34-37 and 40-44 under 35 USC §103 as being unpatentable over Gallego et al (US 6,048,621) in view of Tracy et al and Florczak is improper, and should be withdrawn.

Rejection of claims 1, 2, 5-8, 10-16, 18, 23, 34-35, 38-42 and 44 were rejected under 35 USC §103 as being unpatentable over Riaz et al (US 5,385,751) in view of Tracy et al and Florczak.

With regard to the Riaz reference, the Examiner acknowledged that Riaz does not explicitly teach the use of applicants tungsten precursor. Applicants assert that Riaz specifically teaches the use of a tungsten alkoxide precursor in a CVD process. Riaz does not explicitly or implicitly, suggest any other tungsten containing precursor. Thus, it is respectfully submitted that the disclosure of Riaz is no broader than the disclosure of the Gallego reference. Therefore, the same assertions made with regard to Gallego are also applicable against the rejection based on Riaz.

As before, applicant respectfully asserts that Tracy does not disclose a chemical vapor deposition process, as is claimed in the amended independent claims, but instead teaches a plasma deposition process, which is significantly different, and would be so recognized by one skilled in the art. Tracy, as demonstrated above, thus teaches that the reactants tungsten chloride and tungsten oxytetrachloride are useful in deposition processes carried out under vacuum, at low temperature and which use electrical energy to drive plasma formation. These processes are different from, and in fact are irrelevant to the chemical vapor deposition processes of the present invention, which are carried out at atmospheric pressure and high temperature, and which use heat to drive the reaction and not electrical energy. Thus, one skilled in the art would not look to the Tracy reference as being relevant to the present invention. Therefore, the use of the Tracy reference against the present invention is improper.

Also, the use of Tracy and Florczak together suffers from the same deficiencies asserted above. The Tracy reference is not applicable to the present invention because it teaches a different process, not one that a person skilled in the art would look to when designing a CVD process. With regard to Florczak, while this reference teaches a CVD method, nothing in this

reference is relevant to the *deposition of tungsten oxide*. Florczak primarily addresses the deposition of titania using the reactor described in Figure 1 of the reference. Only in the abstract, and at column 6, line 55, does Florczak suggest the use of the process with any other metals. Even here, the only other suggested metals are tin germanium and vanadium. There is *nothing to suggest to one skilled in the art that the processes of Florczak would be compatible with metals outside this group, and certainly not to tungsten.* As there is no suggestion in Tracy to use a chemical vapor deposition process, and no suggestion in Florczak that the process described therein would be compatible with any metals not listed, i.e. tungsten, there is nothing in either reference to lead one skilled in the art to combine those references. Therefore, it is respectfully submitted that the combination of these references is improper.

In view of the above, the Rejection of claims 1, 2, 5-8, 10-16, 18, 23, 34-35, 38-42 and 44 under 35 USC §103 as being unpatentable over Riaz et al (US 5,385,751) in view of Tracy et al and Florczak is submitted to be improper, and it is respectfully requested that this rejection be withdrawn.

Rejection of claims 1, 2, 8, 10-14, 17, 19, 34, 38-40 and 42 are rejected under 35 USC §103 as being unpatentable over Florczak in view of Proscia or vice versa.

The Examiner asserts that it would be obvious to use the metal chloride taught by Florczak in the process taught by Proscia. Applicants asserts that this rejection is not well founded. As noted, Florczak does not teach or suggest any tungsten precursors useful in a chemical vapor deposition process used to obtain a tungsten oxide coating. The isolated statement that Florczak embraces "the use of other metallic halides or a combination of metal halides in the production of novel metal oxide films on hot glass" teaches essentially nothing of substance. This sort of open ended statement does not possibly enable one skilled in the art to arrive at a specific deposition process as shown in the present invention. It suggests that the Florczak apparatus could, potentially, be used with other metal chlorides, but *says nothing about its the use with any tungsten compound.* This deficiency prevents one skilled in the art from gaining any real insight from the Florczak reference into the present invention. With regard to Proscia, again, this reference only teaches the production of fluorine doped tungsten oxide films

using tungsten hexafluoride as the precursor. There is no teaching or suggestion in the Proscia reference regarding the formation of a tungsten oxide film. One skilled in the art would not, from this combination of references, anticipate the present invention as claimed.

Applicant's invention lies in the discovery that tungsten oxide films can be deposited on the surface of a hot glass ribbon (500-720°C) by directing a gas stream containing a tungsten oxyhalide or tungsten chloride and a source of oxygen onto the surface thereof. Each of the references cited by the Examiner has several deficiencies which prevent their combination against the present claims. Proscia and Gallego show the deposition of tungsten containing coatings but fail to show the precursors as claimed in the present invention. The Tracy reference is directed towards a plasma deposition process, which is incompatible with the chemical vapor deposition process disclosed herein. Florczak does not disclose or suggest the deposition of tungsten oxide coatings. Therefore, it is respectfully submitted that applicant's process is novel over any reasonable combination of the applied references.

Therefore, on the basis of the forgoing arguments, it is respectfully submitted that independent claims 1, 20, 38, 40 and 41 fully distinguish over the applied references. Any dependent claims not specifically discussed hereinabove are believed to be allowable based, at least, upon their dependence on allowable base claims as discussed above.

In view of the above remarks, a favorable reconsideration of the present application and the passing of this application to issue with all claims allowed are courteously solicited. If the Examiner wishes to modify any of the language of the claims in an effort to move the application towards allowance, a telephone call to the undersigned would be greatly appreciated.

Respectfully submitted,

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